



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/829,500	04/09/2001	Craig M. Gates	10003884-1	6732

7590 04/30/2004

HEWLETT-PACKARD COMPANY  
Intellectual Property Administration  
P.O. Box 272400  
Fort Collins, CO 80527-2400

EXAMINER

MUTSCHLER, BRIAN L

ART UNIT	PAPER NUMBER
----------	--------------

1753

DATE MAILED: 04/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/829,500

Applicant(s)

GATES ET AL.

Examiner

Brian L. Mutschler

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 19-35 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 32-34 is/are allowed.
- 6) ☒ Claim(s) 18-25 and 27-31 is/are rejected.
- 7) ☒ Claim(s) 26 and 35 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Comments***

1. Applicant's cancellation of claims 1-18 in the response submitted December 22, 2003, is acknowledged.
2. The objection to the drawings has been overcome by Applicant's amendment to the specification to properly identify all reference characters.
3. The objection to the specification has been overcome by Applicant's amendment to the specification to correct minor informalities.
4. The objections and rejections of claims 15, 17, and 18, have been overcome by Applicant's cancellation of those claims.

### ***Claim Objections***

5. Claims 31 and 35 are objected to because of the following informalities:
  - a. There are two claims labeled "claim 31" in the claims. The claims should be renumbered.
  - b. In claim 35 at line 3, please delete the second period (".") located at the end of the line.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Art Unit: 1753

7. Claim 31 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The second claim 31 depends from claim 31. This claim is indefinite because it depends from itself, as well as the other claim 31.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 19-25 and 28-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Donahue et al. (U.S. Pat. No. 2,702,270) in view of Lam et al. (U.S. Pat. No. 4,773,971) and in view of Kenworthy et al. (U.S. Pat. No. 4,549,939).

Regarding claim 19, Donahue et al. disclose an electroforming mandrel comprising a glass substrate **2**, on which is formed a layer of beeswax **8** and a sputtered layer of palladium **10** (metal layer) (fig. 5; col. 2, line 46 to col. 3, line 62). The glass substrate **2** comprises a plurality of glass-formed raised features extending above the top surface (figs. 2 and 4; col. 2, lines 46-62). A conductive pattern of conductive areas is formed by rubbing off the palladium at the top of the raised features (fig. 6; col. 3, lines 51-62). The mandrel is then used to electroplate nickel **14** onto the conductive areas (fig. 7; col. 3, line 63 to col. 4, line 4). After the nickel **14** is plated, the

electroformed screen **16** is removed along with the palladium layer (col. 3, line 75 to col. 4, line 4).

Regarding claim 21, the metal layer **10** conforms to the shape of the glass substrate **2** (fig. 5).

Regarding claims 25, 30, and 31, the raised features on the glass substrate **2** are pillars that have tapered side walls and a top diameter smaller than the base diameter (figs. 2 and 4). The electroformed screen **16** conforms to the shape of the pillar walls (fig. 7).

The mandrel of Donahue et al. differs from the instant invention because Donahue et al. do not teach the following:

- a. The metal layer has a first portion above the top surface of the substrate and a second portion formed above the raised features, and the first portion is connected to or integral with the second portion, as recited in claims 19 and 20.
- b. A dielectric layer formed above the second portion of the metal layer, as recited in claim 19.
- c. The first portion and second portion of the metal layer are directly adjacent to the substrate, as recited in claim 22.
- d. The dielectric layer conforms to the shape of the glass-formed raised features, as recited in claim 23.
- e. The dielectric layer is directly adjacent to the second portion of the metal layer, as recited in claim 24.

- f. The dielectric layer has a thickness of 3500 to 4000 angstroms, as recited in claim 28.
- g. The metal layer has a thickness in the range of 0.5 to 1.0 microns, as recited 29.

Regarding claim 19, Kenworthy et al. disclose a mandrel and teach that the mandrel may formed in either of two ways. In both methods, a photoresist (dielectric) is formed on a continuous conductive layer that is formed on a non-conductive substrate (col. 2, lines 1-26). In the first method, the photoresist is patterned and partially removed so that metal can be electroplated on the exposed conductive pattern between walls of the photoresist (col. 2, lines 1-26). In the second method, the photoresist is patterned and partially removed, and then the conductive layer is etched with a pattern and the remainder of the photoresist is removed (col. 2, lines 1-26). This second method is similar to the rubbing off of the conductive material as taught by Donahue et al. Kenworthy et al. teach that both mandrels can be used equivalently (col. 2, lines 1-26). Like the mandrel of Donahue et al., both mandrels have a patterned surface comprising conductive patterns surrounded by non-conductive areas.

Regarding claims 19, 20, and 22, Lam et al. disclose a mandrel for electroforming orifice plates for ink jet printers, wherein the mandrel comprises a metal layer **1-3** formed directly on a glass substrate **1-7** (fig. 1B; col. 3, lines 15-30). The metal layer **1-3** is continuous and includes portions under a dielectric layer **1-1** and exposed on the top surface of the substrate **1-7** (fig. 1B). Depositing the metal layer **2-3** directly on the substrate **2-1** allows the mandrel to be reusable (col. 3, lines 15-30).

Regarding claims 23 and 24, Lam et al. teach that the conformal dielectric layer **1-1** is formed directly on the metal layer **1-3** (fig. 1B; col. 3, lines 15-30).

Regarding claims 28 and 29, the thickness of the dielectric layer and the metal layer are result effective variables. The thickness of the dielectric layer depends on the resistivity of the dielectric (lower resistivity materials require thicker layers) and the thickness of the electroplated article. The thickness of the metal layer depends on the adhesion to the substrate and the electroplated article, as well as the conductivity of the metal layer. Regarding claim 29, Lam et al. teach that the metal layer **1-3** has a thickness of 100 angstroms (100 angstroms = 0.01 microns) to 200 microns (col. 3, lines 15-30).

Regarding claim 19, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the mandrel of Donahue et al. to form a dielectric layer on top of the conductive layer as taught by Kenworthy et al. because Kenworthy et al. teach that both mandrels are equally effective and using a dielectric photoresist that is developed creates a more uniform and reproducible mandrel as opposed to the rubbing technique used by Donahue et al. Using a dielectric layer on a continuous metal layer means that the layer would have two integral portions, including one covered by the dielectric and one exposed for plating thereon.

Regarding claim 22, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the beeswax and palladium layers disclosed by Donahue et al. to use a metal layer formed directly on the substrate

as taught by Lam et al. because forming the metal layer directly on the substrate creates a more durable mandrel that can be reused.

Regarding claims 28 and 29, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the dielectric layer and metal layer in the above-described mandrel to use the claimed ranges because the thickness of layers are result effective variables that depend on the desired electroformed article.

10. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Donahue et al. (U.S. Pat. No. 2,702,270) in view of Lam et al. (U.S. Pat. No. 4,773,971) and in view of Kenworthy et al. (U.S. Pat. No. 4,549,939), as applied above to claims 19-25 and 28-31, and further in view of Lam (U.S. Pat. No. 5,255,017).

Donahue et al., Kenworthy et al., and Lam et al. describe a mandrel having the limitations recited in claims 19-25 and 28-31 of the instant invention, as explained above in section 9. Lam et al. additionally teach that the dielectric material may be silicon nitride or different non-conductive materials (col. 3, lines 41-46).

The mandrel described by Donahue et al., Kenworthy et al., and Lam et al. differs from the instant invention because they do not disclose the use of silicon carbide as the dielectric material, as recited in claim 27.

Lam discloses a mandrel for electroforming orifice plates comprising a conductive layer formed on a glass substrate and a dielectric layer formed on the

conductive layer (col. 2, lines 23-48). The dielectric layer may be made of silicon nitride, silicon carbide, or another suitable dielectric layer (col. 2, lines 40-48).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the dielectric layer in the mandrel described by Donahue et al., Kenworthy et al., and Lam et al. to use silicon carbide as taught by Lam because Lam teaches that silicon carbide and silicon nitride can be used equivalently as a dielectric layer in electroforming mandrels.

***Allowable Subject Matter***

11. Claim 26 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. The following is a statement of reasons for the indication of allowable subject matter: Claims 26 and 32-35 are distinguished over the prior art of record by providing a glass substrate having glass-formed raised pillars comprising a dielectric layer covering a second portion of a connected metal layer and the top and side walls of the pillars. While the prior art of record teaches the formation of a dielectric over a metal portion and the formation of dielectric areas on the top of glass-formed pillars, the prior art neither teaches nor suggests the formation of the dielectric on the side walls of the pillars. Bakewell (U.S. Pat. No. 3,703,450) teaches the formation of pillars **22** that are formed entirely of a dielectric material and metal layers **10** formed in the areas between the pillars (see fig. 5). However, the pillars are not part of the substrate, and they are

not covered by a second portion of a metal layer. Similarly, Donahue et al. (U.S. Pat. No. 2,702,270) only teach the formation of exposed dielectric areas on the top of the pillars. As explained in the instant disclosure, the formation of pillars covered by a dielectric on the top and side walls more accurately allows the control of the formation of the object, such as an ink jet nozzle (see par. [0006] to [0007]).

### ***Response to Arguments***

13. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Pat. No. 2,166,367 (Norris) discloses a mandrel having a pillared substrate and discloses the use of a dielectric material formed at the top of the pillars.

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not


mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian L. Mutschler whose telephone number is (571) 272-1341. The examiner can normally be reached on Monday-Friday from 7:30am to 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

blm  
April 22, 2004

  
NAM NGUYEN  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700